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(54) **TIME ENCODED RADIATION IMAGING**

(71) Applicant: **Sandia Corporation**, Albuquerque, NM (US)

(72) Inventors: **Peter Marleau**, Dublin, CA (US); **Erik Brubaker**, Oakland, CA (US); **Scott Kiff**, Pleasanton, CA (US)

(73) Assignee: **Sandia Corporation**, Albuquerque, NM (US)

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See application file for complete search history.

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Primary Examiner — Kiho Kim
(74) *Attorney, Agent, or Firm* — Medley Behrens & Lewis LLC

(57) **ABSTRACT**

The various technologies presented herein relate to detecting nuclear material at a large stand-off distance. An imaging system is presented which can detect nuclear material by utilizing time encoded imaging relating to maximum and minimum radiation particle counts rates. The imaging system is integrated with a data acquisition system that can utilize variations in photon pulse shape to discriminate between neutron and gamma-ray interactions. Modulation in the detected neutron count rates as a function of the angular orientation of the detector due to attenuation of neighboring detectors is utilized to reconstruct the neutron source distribution over 360 degrees around the imaging system. Neutrons (e.g., fast neutrons) and/or gamma-rays are incident upon scintillation material in the imager, the photons generated by the scintillation material are converted to electrical energy from which the respective neutrons/gamma rays can be determined and, accordingly, a direction to, and the location of, a radiation source identified.

20 Claims, 7 Drawing Sheets